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FDP5800

N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

Features

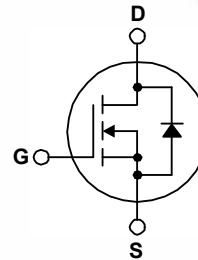
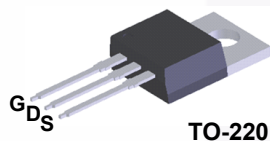
- $R_{DS(on)} = 4.6 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 80 \text{ A}$
- High Performance Trench Technology for Externly Low $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Power Tools
- Motor Drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | FDP5800 | Unit |
|----------------|---|--|---------------------|
| V_{DSS} | Drain-Source Voltage | 60 | V |
| V_{GSS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current | - Continuous ($T_C = 25^\circ\text{C}$) | 80 |
| | | - Continuous ($T_C = 100^\circ\text{C}$) | 80* |
| | | - Continuous ($T_A = 25^\circ\text{C}$) | 14 |
| I_{DM} | Drain Current - Pulsed | 320 | A |
| E_{AS} | Single Pulsed Avalanche Energy (Note 1) | 652 | mJ |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate Above 25°C | 242 | W |
| | | 1.61 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +175 | $^\circ\text{C}$ |

*Drain current limited by package.

Thermal Characteristics

| Symbol | Parameter | FDP5800 | Unit |
|-----------------|---|---------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.62 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 62.5 | |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|----------|---------|----------------|-----------|------------|----------|
| FDP5800 | FDP5800 | TO-220 | Tube | N/A | N/A | 50 units |

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|------------|------|------|------|------|
|--------|-----------|------------|------|------|------|------|

Off Characteristics

| | | | | | | |
|------------|------------------------------------|--|----|----|-----------|---------------|
| B_{VDSS} | Drain-Source Breakdown Voltage | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_J = 25^\circ\text{C}$ | 60 | -- | -- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 48 \text{ V}$ $V_{GS} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$ | -- | -- | 1 | μA |
| I_{GSS} | Gate-Body Leakage Current, Forward | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ | -- | -- | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|---|-----|------|------|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$ | 1.0 | -- | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source On Resistance | $V_{GS} = 10 \text{ V}, I_D = 80 \text{ A}$ | -- | 4.6 | 6.0 | m Ω |
| | | $V_{GS} = 4.5 \text{ V}, I_D = 80 \text{ A}$ | -- | 5.9 | 7.2 | m Ω |
| | | $V_{GS} = 5 \text{ V}, I_D = 80 \text{ A}$ | -- | 5.6 | 7.0 | m Ω |
| | | $V_{GS} = 10 \text{ V}, I_D = 80 \text{ A},$ $T_J = 175^\circ\text{C}$ | -- | 10.4 | 12.6 | m Ω |

Dynamic Characteristics

| | | | | | | |
|--------------|----------------------------------|---|----|------|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$ | -- | 6890 | 9160 | pF |
| C_{oss} | Output Capacitance | | -- | 750 | 1000 | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 295 | 445 | pF |
| R_G | Gate Resistance | $V_{GS} = 0.5 \text{ V}, f = 1 \text{ MHz}$ | -- | 1.2 | -- | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | $V_{GS} = 0 \text{ V to } 10 \text{ V}$ | -- | 112 | 145 | nC |
| $Q_{g(TH)}$ | Total Gate Charge at 5V | $V_{GS} = 0 \text{ V to } 5 \text{ V}$ | -- | 58 | -- | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS} = 0 \text{ V to } 1 \text{ V}$ | -- | 7.0 | -- | nC |
| Q_{gs} | Gate to Source Gate Charge | $V_{DS} = 30 \text{ V},$ $I_D = 80 \text{ A},$ $I_g = 1 \text{ mA}$ | -- | 23 | -- | nC |
| Q_{gs2} | Gate Charge Threshold to Plateau | | -- | 13 | -- | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | -- | 18 | -- | nC |

Switching Characteristics ($V_{GS} = 10\text{V}$)

| | | | | | | |
|--------------|---------------------|---|----|----|-----|----|
| t_{ON} | Turn-On Time | $V_{DD} = 30 \text{ V}, I_D = 80 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 1.5 \Omega$ | -- | 37 | 85 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | -- | 18 | 46 | ns |
| t_r | Turn-On Rise Time | | -- | 19 | 47 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 55 | 120 | ns |
| t_f | Turn-Off Fall Time | | -- | 9 | 28 | ns |
| t_{OFF} | Turn-Off Time | | -- | 64 | 138 | ns |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|------------------------------------|--|----|-----|------|----|
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0 \text{ V}, I_{SD} = 80 \text{ A}$ | -- | -- | 1.25 | V |
| | | $V_{GS} = 0 \text{ V}, I_{SD} = 40 \text{ A}$ | -- | -- | 1.0 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0 \text{ V}, I_{SD} = 60 \text{ A},$ | -- | 58 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | $dI_F/dt = 100 \text{ A}/\mu\text{s}$ | -- | 106 | -- | nC |

Notes:

1: $L = 1 \text{ mH}, I_{AS} = 36 \text{ A}, V_{DD} = 54 \text{ V}, V_{GS} = 10 \text{ V}, R_G = 25 \Omega,$ Starting $T_J = 25^\circ\text{C}$

Typical Performance Characteristics

Figure 1. On-Region Characteristics

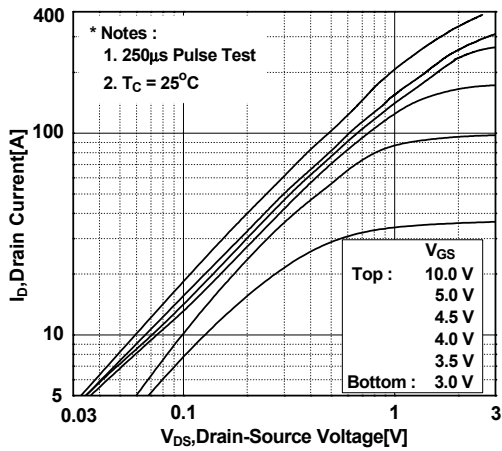


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

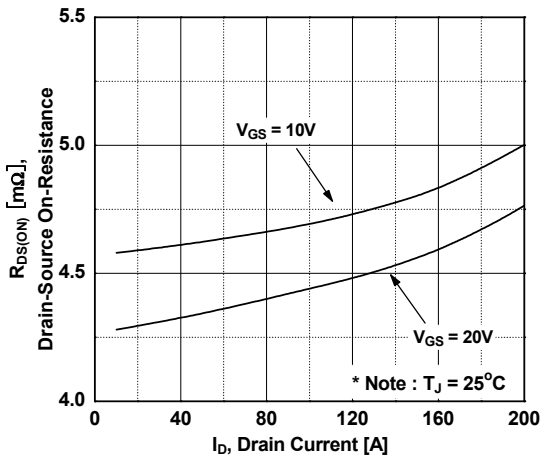


Figure 5. Capacitance Characteristics

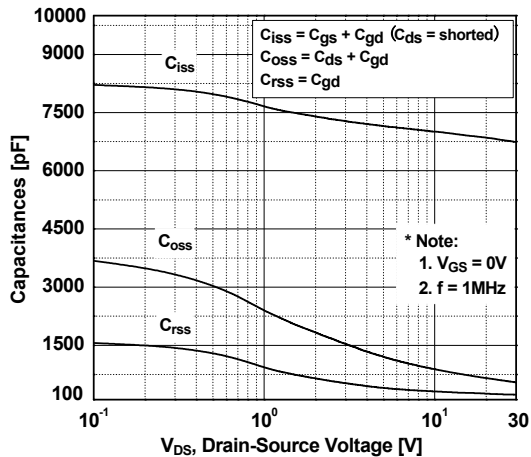


Figure 2. Transfer Characteristics

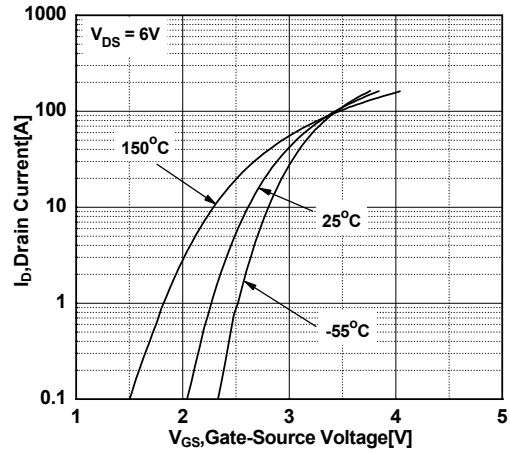


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

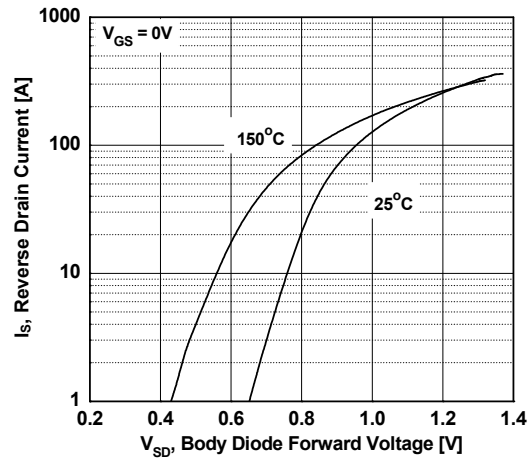
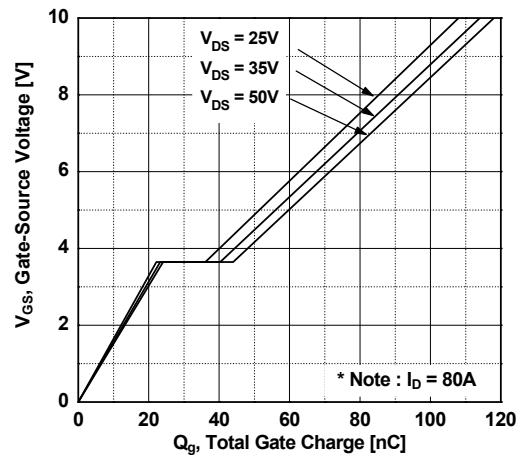


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

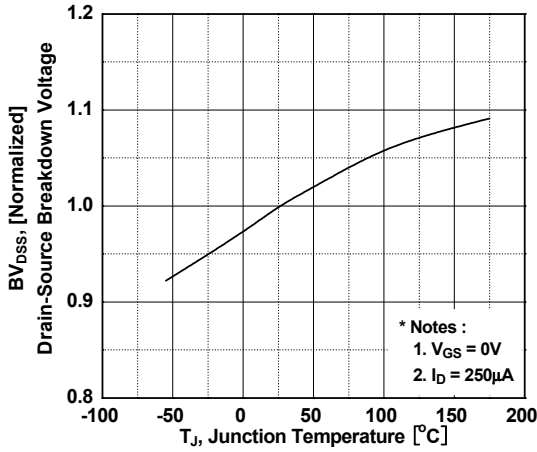


Figure 8. On-Resistance Variation vs. Temperature

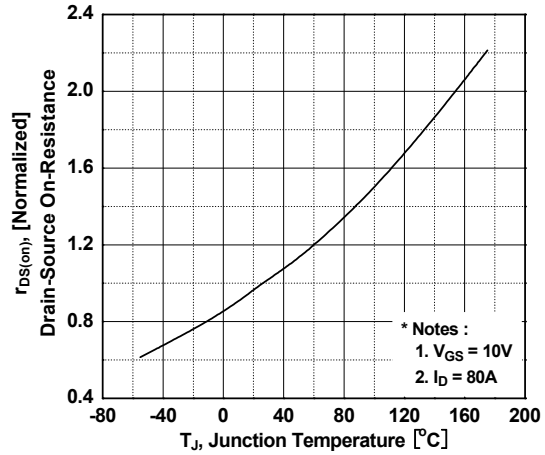


Figure 9. Maximum Safe Operating Area

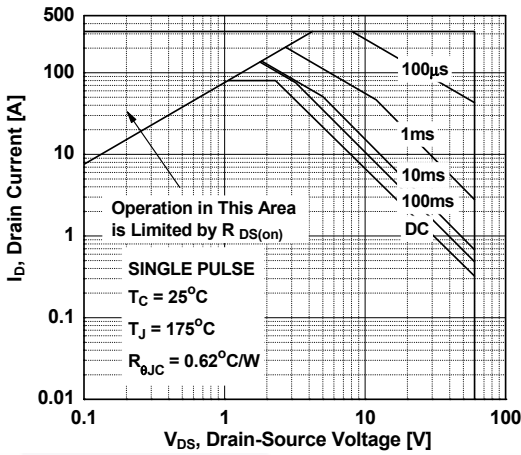


Figure 10. Maximum Drain Current vs. Case Temperature

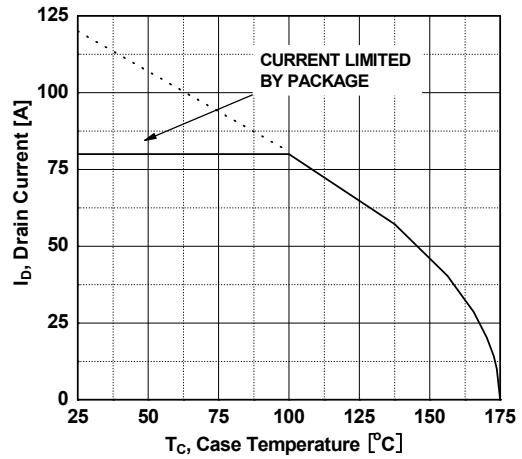


Figure 11. Transient Thermal Response Curve

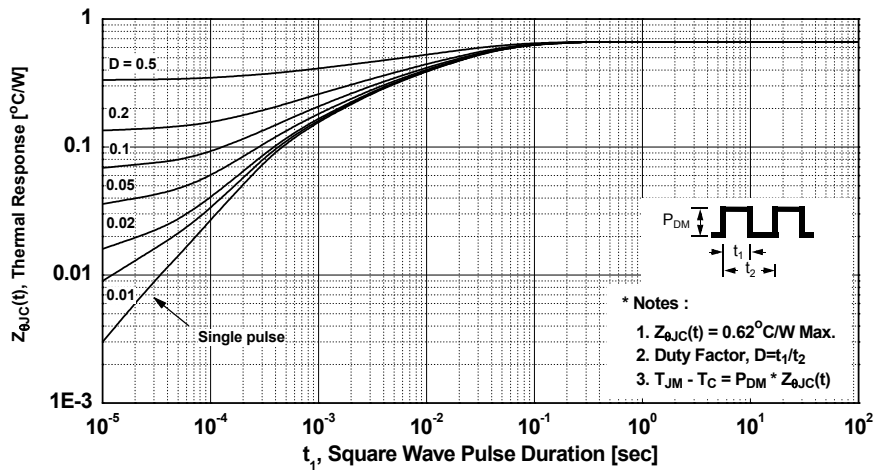




Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

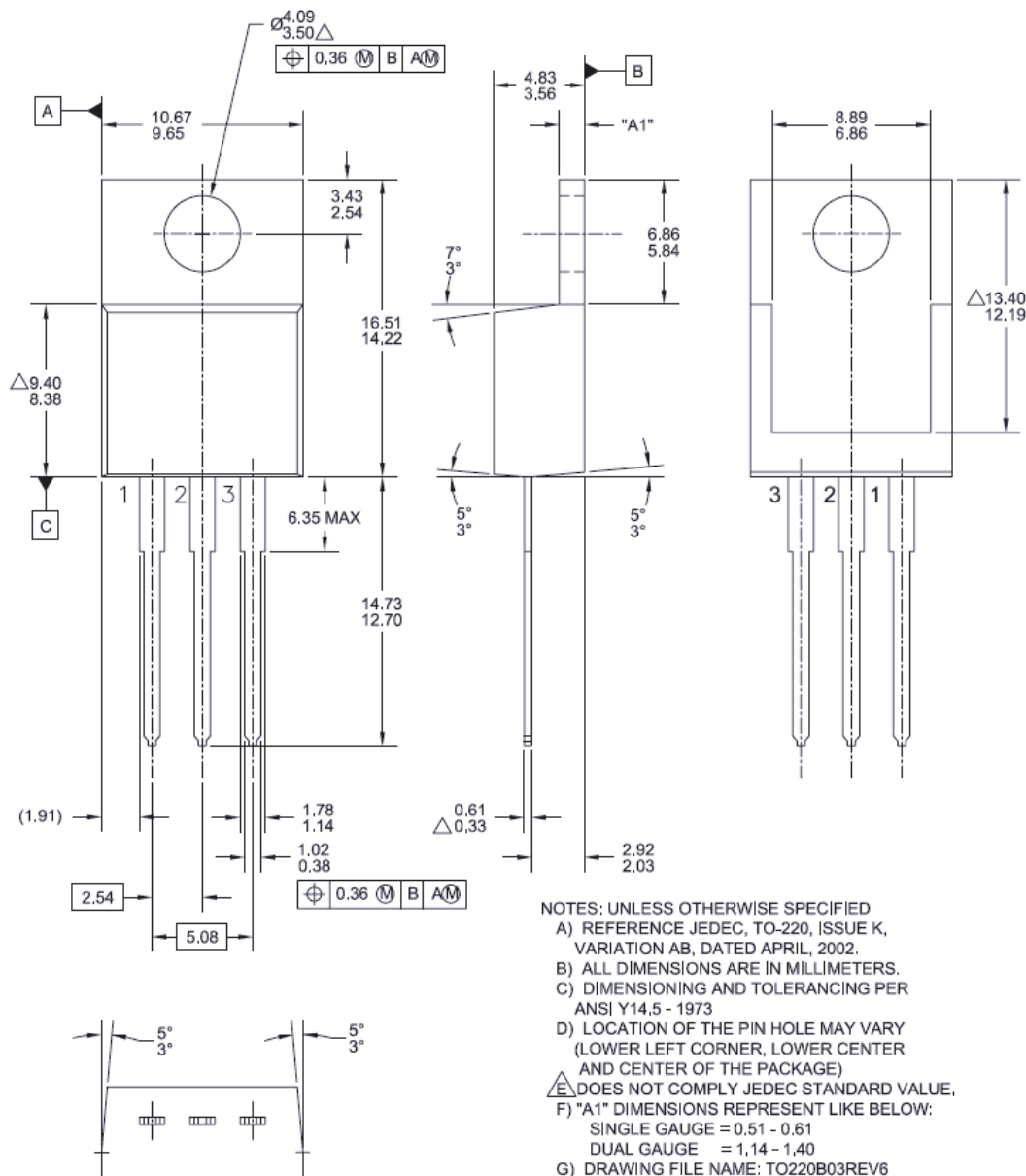


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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